

PATENT ABSTRACTS OF JAPAN

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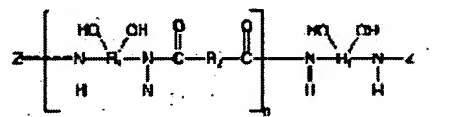
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(54) AROMATIC POLYHYDROXYAMIDE

(57)Abstract:

PROBLEM TO BE SOLVED: To obtain a photosensitive resin composition which has excellent storage stability, solubility characteristics in alkalis and patterning characteristics and whose heat-cured film satisfies heat resistance and mechanical performances stably and to a high level, by mixing an aromatic polyhydroxyamide having end groups of a specific structure and a diazoquinone compound.

SOLUTION: An aromatic dicarboxylic acid or a derivative thereof and a bis-(o-aminophenol) are subjected to amide-polycondensation in a proper solvent and then to terminal blocking reaction by adding thereto di(t-butyl) dicarbonate to obtain an aromatic polyhydroxyamide represented by formula I (wherein R1 is a tetravalent aromatic group; R2 is a bivalent aromatic group; n is 2-150; and Z is a monovalent organic group, 40 mol% or more of which is formula II). If necessary, the reaction product can be purified by feeding it in a poor solvent and repeating reprecipitation. A positive photosensitive resin composition is obtained by mixing the aromatic polyhydroxyamide and an optically active component such as a diazoquinone compound.



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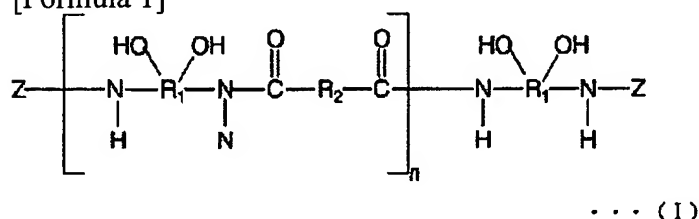
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CLAIMS

[Claim(s)]

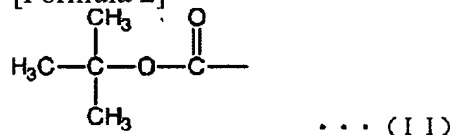
[Claim 1] An aromatic series polyhydroxy amide shown by the following general formula (I).

[Formula 1]



For the inside R1 of [type, a tetravalent aromatic series radical and R2 are divalent aromatic series radicals, and n is the integer of 2-150. Z is a univalent organic radical and more than 40 mol % is characterized by being the following structure expressions (II) of Z at least.]

[Formula 2]



[Claim 2] An aromatic series polyhydroxy amide according to claim 1 and a positive type photopolymer constituent containing a diazo quinone compound.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] This invention relates to the aromatic series polyhydroxy amide of the alkali fusibility which is the precursor of a heat-resistant-resin material, and the positive type photopolymer constituent containing this.

[0002]

[Description of the Prior Art] Conventionally, the polyimide resin having the outstanding thermal resistance, an electrical property, a mechanical characteristic, etc. is used for the surface-protection film of a semiconductor device, and the interlayer insulation film. Generally this polyimide resin is offered in the form of a photosensitive polyimide precursor constituent, can make it form easily by performing patterning according to spreading and an activity beam of light, development, heat imide-ized processing, etc., and has the feature that large process compaction is attained compared with conventional non-light-sensitive polyimide.

[0003] However, it is necessary to use the organic solvent of large quantities, such as an N-MECHIRU 2-pyrrolidone, as a developer, and the cure against a deorganic solvent has been demanded from the rise of safety and an environmental problem in recent years etc. in the development process. in response, the proposal of the heat-resistant photopolymer material in which development is possible should recently various-kinds-make it be the same as that of a photoresist in a thin alkali aqueous solution -- *****.

[0004] The method of mixing with optical active ingredients, such as quinone diazide, and using especially, the polyhydroxy amide, for example, the poly benzoxazole (PBO) precursor, of aquosity alkali fusibility, attracts attention in recent years. (Provisional-Publication-No. No. 96162 [63 to] official report etc.)

Formation of a positive type pattern is easy for these, and they are good, and since they have the heat-curing film property equivalent to polyimide, they attract attention as promising alternate material of an organic solvent development mold polyimide precursor. [of development nature and conservation stability] However, the PBO precursor which is indicated or is obtained by the method currently indicated also still has many troubles.

[0005] Although a PBO precursor is obtained according to a polycondensation with screw - (ortho aminophenol), dicarboxylic acid, or its derivative, a polymer end is manufactured in the form where it usually stopped at the amino group, from the stability of the polymer obtained, or the point on handling. However, when a polymer end is an amino group, the sensitization agent diazo quinone compound which lives together in a photosensitive constituent denaturalizes and deteriorates with time, and there is a problem that the conservation stability of a constituent gets worse extremely. In order to improve this problem, the method of reforming the amino terminal of PBO polymer to non-basicity is proposed.

[0006] For example, although it is a case as a negative-mold photosensitivity constituent, the method of carrying out end closure in the form of aromatic amide using benzoyl chloride etc. is proposed (JP, 7-128846, A). However, although the stability as a positive type photosensitivity constituent improves when the polymer which only made the polymer end aromatic amide in this way is used, the heat-curing

film obtained cannot be very brittle, and cannot satisfy practicability ability in dynamics property. [0007] Moreover, in order to improve this dynamics property, the radical which has an unsaturated bond called the alkenyl or alkynyl, such as norbornene, is introduced into a polymer end, and the method of reforming is proposed. (JP,5-197153,A)

Since surely according to this method the stability as a positive type photosensitivity constituent is improved and the additional crosslinking reaction of a partial saturation radical arises at the time of heat hardening processing of a paint film, the coat excellent in the mechanical property or the adhesive property can be formed.

[0008] Thus, although the method of introducing a partial saturation radical into a polymer end, and making it add and construct a bridge with heat is technique extensively used in heat-curing mold polyimide etc. from the former, generally thermal resistance is inadequate [the crosslinking bond by the method concerned] in order to take the gestalt which connected the aliphatic series radical. For example, when it heat-treats at an elevated temperature 350 degrees C or more, it decomposes without the ability of a crosslinking bond bearing, and there is a defect that not only the mechanical property of a heat-curing film but also an adhesive property with a base material will fall substantially. This poses a big problem in respect of reliability, when used as the surface-protection film of a semiconductor device, and an interlayer insulation film.

[0009]

[Problem(s) to be Solved by the Invention] Formation of a positive type pattern is possible for this invention by the development process by exposure and the alkali aqueous solution. The outstanding conservation stability is shown in the positive type photosensitivity constituent containing a diazo quinone compound, and it sets to a still larger heat hardening temperature requirement. It aims at offering the surface-protection film of a semiconductor device, the heat-resistant photopolymer constituent which is satisfied with stability and a high level of the thermal resistance demanded as an interlayer insulation film use, and the dynamics engine performance, and the aromatic series hydroxy polyamide used suitable for the constituent.

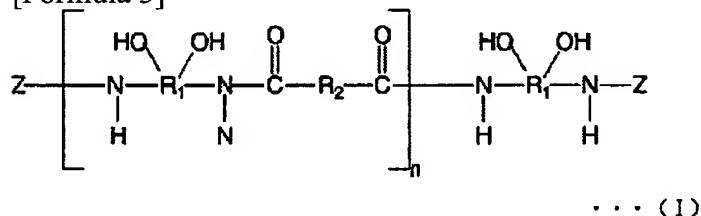
[0010]

[Means for Solving the Problem] They inquired wholeheartedly so that this invention persons perceived an end group of a polyhydroxy amide used as an alkali fusibility PBO precursor, and might not produce deterioration of a diazo quinone compound in a positive type photopolymer constituent using this, might not choose heat hardening temperature but might make outstanding thermal resistance and an outstanding hardening film property discover.

[0011] Consequently, it found out that the above-mentioned technical problem was attained by changing an amino terminal of a polyhydroxy amide into an end group of specific structure. That is, this invention relates to a positive type photopolymer constituent containing an aromatic series hydroxy polyamide shown by the following general formula (I), and this and a diazo quinone compound.

[0012]

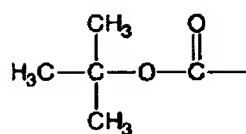
[Formula 3]



[0013] However, inside R1 of a formula A tetravalent aromatic series radical and R2 It is a divalent aromatic series radical. It is characterized by for n being the integer of 2-150, and for Z being a univalent organic radical, and more than 40 mol % at least being the following structure expressions (II) of Z.

[0014]

[Formula 4]



... (11)

[0015] Hereafter, this invention is explained to details. The aromatic series polyhydroxy amide of this invention is obtained by carrying out the amide polycondensation of aromatic series dicarboxylic acid or its derivative, and screw - (ortho aminophenol). As a dicarboxylic acid derivative containing the divalent aromatic series radical R2 suitably used by this invention here, aromatic series dicarboxylic acid dichloride is desirable. For example, phthalic-acid, isophthalic acid, terephthalic-acid, 4, and 4'-diphenyl ether dicarboxylic acid, - diphenyl ether dicarboxylic acid, and 4 '3, 3'-diphenyl ether dicarboxylic acid, [3, and] - biphenyl dicarboxylic acid, and 4 and 4 '4, 4'-benzophenone dicarboxylic acid, - hexafluoro isopropylidene 2 benzoic acid, a 4 and 4 '4, 4'-dicarboxy diphenyl amide, 1, 4-FENI range ethanoic acid, 1, and 1-screw (4-carboxyphenyl)-1-phenyl - 2, 2, and 2-trifluoro ethane, A screw (4-carboxyphenyl) sulfide, screw (4-carboxyphenyl) tetra-phenyl disiloxane, Screw (4-carboxyphenyl) tetramethyl disiloxane, a screw (4-carboxyphenyl) sulfone, Screw (4-carboxyphenyl) methane, 5-tert-butyl isophthalic acid, 5-BUROMO isophthalic acid, 5-fluoro isophthalic acid, 5-chloro isophthalic acid, 2 and 2-screw-(p-carboxyphenyl) propane, 4, and 4' -(p-phenylene dioxy) 2 benzoic acid, Although an activity ester object with 2, 6-naphthalene dicarboxylic acid or these acid chloride objects, hydroxy benzotriazol, etc. can be mentioned, it is not limited to these. moreover, these things are independent -- or you may mix and use.

[0016] moreover, as a screw (o-aminophenol) containing the tetravalent aromatic series radical R1 suitably used by this invention For example, 3, 3, - dihydroxy benzidine, 3, the 3'-diamino -4, a 4'-dihydroxy biphenyl, 3, 3'-dihydroxy -4, 4'-diaminodiphenyl sulfone, A screw-(3-amino-4-hydroxyphenyl) methane, 2, and 2-screw-(3-amino-4-hydroxyphenyl) propane, 2 and 2-screw-(3-amino-4-hydroxyphenyl) hexafluoropropane, 2 and 2-screw-(3-hydroxy-4-aminophenyl) hexafluoropropane, A screw-(3-hydroxy-4-aminophenyl) methane, 2, and 2-screw-(3-hydroxy-4-aminophenyl) propane, 3, 3'-dihydroxy -4, a 4'-diamino benzophenone, 3, 3'-dihydroxy -4, 4'-diamino diphenyl ether, 4 and 4' -dihydroxy -3 and 3' -- although - diamino JIFENI ether, 2, 5-dihydroxy -1, 4-diaminobenzene, 4, 6-diamino resorcinol, its mixture, etc. are mentioned, it is not limited to this.

[0017] Although the aromatic series polyhydroxy amide of this invention is a polycondensation object which consists of the above-mentioned raw material, when using the activity ester object of aromatic series dicarboxylic acid dichloride or aromatic series dicarboxylic acid, it can be obtained in a suitable solvent by mixing with screw - (ortho aminophenol) under existence of basic compounds, such as a pyridine. However, when using aromatic series dicarboxylic acid, a suitable condensing agent is needed. As such a condensing agent, a well-known dehydration condensing agent can be used conventionally, for example, dicyclohexylcarbodiimide, 1-ethoxycarbonyl-2-ethoxy -1, 2-dihydroquinoline, 1, and 1'-carbonyl dioxy-G 1 and 2, 3-benzotriazol, N,N'-disuccinimidylcarbonate, phosphite, etc. can be mentioned. Among these, it is 1-hydroxy when using dicyclohexylcarbodiimide. - It is desirable to use with 1, 2, and 3-benzotriazol in common.

[0018] After adjusting so that the chain both ends of the polycondensation object which consists of the above-mentioned raw material may serve as an amine mold, the aromatic series polyhydroxy amide of this invention closes this amine end in the form of a urethane bond by the tert-butoxycarbonyl radical, and is attained by reforming to non-basicity. As encapsulant used at this time, JI (tert-butyl) dicarbonate is mentioned as a desirable example.

[0019] As for the rate of closure of the end amino group, it is indispensable that it is [of all amine ends] more than 40 mol % at least, and it is more than 60 mol % more preferably. If this rate of end closure is less than 40-mol %, the conservation stability and the lithography property which excelled at the time of considering as the positive type photosensitivity constituent which is the effect of this invention, and the hardening film physical properties after a cure are not demonstrated enough, and are not desirable.

[0020] Generally the polar solvent which dissolves the polyhydroxy amide to generate thoroughly as a

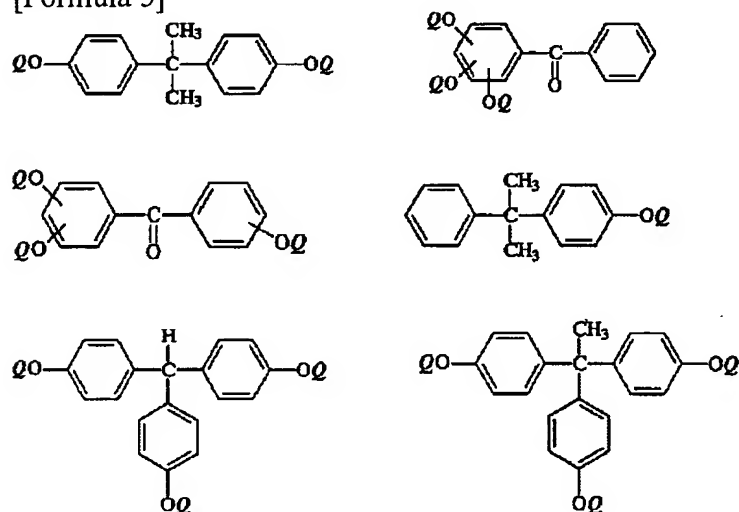
solvent used for the above-mentioned reaction is desirable, for example, a N-methyl-2-pyrrolidone, N,N-dimethylacetamide, N,N-dimethylformamide, dimethyl sulfoxide, tetramethylurea, gamma-butyrolactone, etc. are mentioned. In addition, the ketones and ester which are a common organic solvent in addition to this polar solvent, Lactone, ether, halogenated hydrocarbon, and hydrocarbons For example, an acetone, a methyl ethyl ketone, methyl isobutyl ketone, A cyclohexanone, methyl acetate, ethyl acetate, butyl acetate, oxalic acid diethyl, Ethylene glycol wood ether, diethylene-glycol wood ether, Diethylene-glycol diethylether, dipropylene glycol wood ether, A tetrahydrofuran, dichloromethane, 1,2-dichloroethane, 1, 4-dichlorobutane, a chlorobenzene, o-dichlorobenzene, a hexane, a heptane, benzene, toluene, a xylene, etc. can be used.

[0021] Although a photopolymer constituent can be presented with this resultant as it is, it supplies in the poor solvent of polyhydroxy amides, such as water or a methanol, if needed, and the positive type photopolymer constituent which can also be refined and used and which is another invention again is obtained by repeating reprecipitation further by mixing optical active ingredients, such as a diazo quinone compound, with the above-mentioned polyhydroxy amide. Such a photosensitive diazo quinone compound is a compound which has 1 and 2-benzoquinone diazido or 1, and 2-naphthoquinonediazide structure, and is the well-known matter by the U.S. Pat. No. 2,772,972 official report, the 2,797,213 official report, a 3,669,658 official report, etc.

[0022] As a concrete example of such a compound, the following are mentioned, for example.

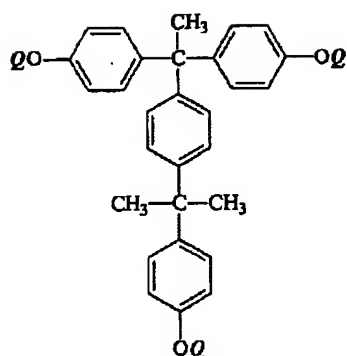
[0023]

[Formula 5]

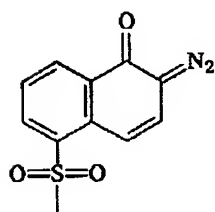


[0024]

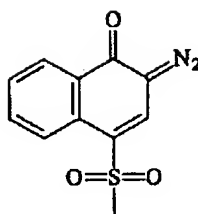
[Formula 6]



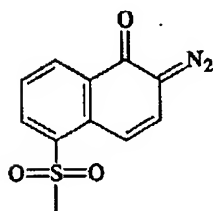
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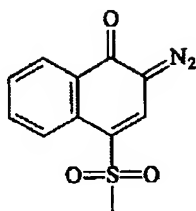
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である。)

[0025] In addition, especially to the positive type photopolymer constituent of this invention, unless the effect of this invention is checked, additives, such as a phenolic compound, a leveling agent, and a silane coupling agent, can be added suitably if needed. The above-mentioned sensitization agent and an additive are dissolved in a solvent with the PBO precursor polymer of this invention, and it is used by making the positive type photopolymer constituent of this invention into the shape of a varnish.

[0026] As a solvent in this case, a N-methyl-2-pyrrolidone, N,N-dimethylacetamide, N,N-dimethylformamide, gamma-butyrolactone, dimethyl sulfoxide, Diethylene-glycol wood ether, diethylene-glycol diethylether, Diethylene-glycol dibutyl ether, propylene glycol monomethyl ether, Dipropylene glycol monomethyl ether, dipropylene glycol wood ether, Propylene-glycol-monomethyl-ether acetate, methyl lactate, Ethyl lactate, butyl lactate, methyl -1, 3-butylene-glycol acetate, 1, the 3-butylene-glycol-3-monomethyl ether, methyl pyruvate, pyruvic-acid ethyl, methyl-3-methoxy propionate, etc. are mentioned, and it may be independent, or you may mix and use.

[0027]

[Embodiment of the Invention] The example of this invention is given to below and the concrete example of this invention is explained.

[0028]

[Example 1] In separable hula SURASUKO of capacity 2L, mixed stirring of the 250g [of N,N-

dimethylacetamide], pyridinesg [26.10] (0.33 mols) and 2, and 2-screw (3-friend no 4-hydroxyphenyl)-hexafluoropropane 69.59g (0.19 mols) was carried out at the room temperature (23 degrees C), and diamine was dissolved. That in which 4 and 4'-diphenyl ether dicarboxylic acid dichloride 44.27g (0.15 mols) was dissolved was separately dropped from the dropping funnel into diethylene-glycol wood ether 130g at this. Under the present circumstances, the separable flask was cooled by the 15-20-degree C water bath. The time amount which dropping took was 25 minutes, and the reaction liquid temperature was 30 degrees C at the maximum. JI (tert-butyl) dicarbonate 26.19g (0.12 mols; 1.5 equivalent weight of all amine ends) was supplied to reaction mixture after 60-minute stirring neglect from dropping termination, churning neglect was carried out at 20-25 degrees C for 6 hours, and the tert-butoxycarbonyl radical was introduced and closed at all the amine ends of a polymer chain.

[0029] By pursuing the residue of the thrown-in encapsulant and JI (tert-butyl) dicarbonate with high performance chromatography (HPLC), the amine end closure conversion in this case could be computed easily, and was 95.1%. Then, it was dropped at the ion exchange water of 5L under high-speed churning, and the obtained polymer was distributed, the above-mentioned reaction mixture was deposited, these was collected, the vacuum drying was suitably carried out after rinsing and dehydration, and the target polyhydroxy amide was obtained.

[0030] Furthermore, when purification of polymer is required, it is possible to carry out by the following methods. That is, the polymer obtained above was remelted to gamma butyrolactone (GBL) 300g, and ion exchange purification was presented. The ion exchange resin to be used was 25g of strong acid nature ion exchange resin, and 50g of weak base nature ion exchange resin, and after it rinsed these suitably and carried out solvent substitute at GBL, it was filled up with and adjusted to the glass column, respectively. The polymer solution was dipped in this and ion exchange purification was performed.

[0031] Ion-exchange-purification Ushiro's reaction mixture was dropped at the ion exchange water of 5L under high-speed stirring, the distributed deposit of the polymer was carried out, these was collected, the vacuum drying was suitably performed after rinsing and dehydration, and the weight average molecular weight Mw (polystyrene reduced property [in an expansion solvent tetrahydrofuran]; it is the same as that of the following.) calculated by GPC obtained the aromatic series polyhydroxy amide of 10,200.

[0032]

[Example 2] Except having made the aromatic series dicarboxylic acid chloride to be used into isophthalic acid dichloride, the same actuation as an example 1 was performed, and 98.5% of rates of amine end closure and the aromatic series polyhydroxy amide of weight-average-molecular-weight Mw:10,000 were obtained.

[0033]

[Example 3] Except having made the input of end encapsulant JI (tert-butyl) dicarbonate into the 3.0 equivalent weight (0.24 mols / 52.38g) of all amine ends, the same actuation as an example 1 was performed, and 100.0% of rates of amine end closure and the aromatic series polyhydroxy amide of weight-average-molecular-weight Mw:10,000 were obtained.

[0034]

[The example 1 of a comparison] Except having not added encapsulant JI (tert-butyl) dicarbonate to the reaction mixture after polycondensation reaction termination, the same actuation as an example 1 was performed, the aromatic series [that a chain end continues being an amino group] polyhydroxy amide (weight-average-molecular-weight Mw:10,100) was prepared, and it considered as the comparison.

[0035]

[The example 2 of a comparison] Except having set the encapsulant JI (tert-butyl) dicarbonate input to 8.73g (0.04 mols; 0.5Eq of all amine ends), the same actuation as an example 1 was performed, and 37.4% of rates of amine end closure and the aromatic series polyhydroxy amide which is weight-average-molecular-weight Mw:10,000 were obtained.

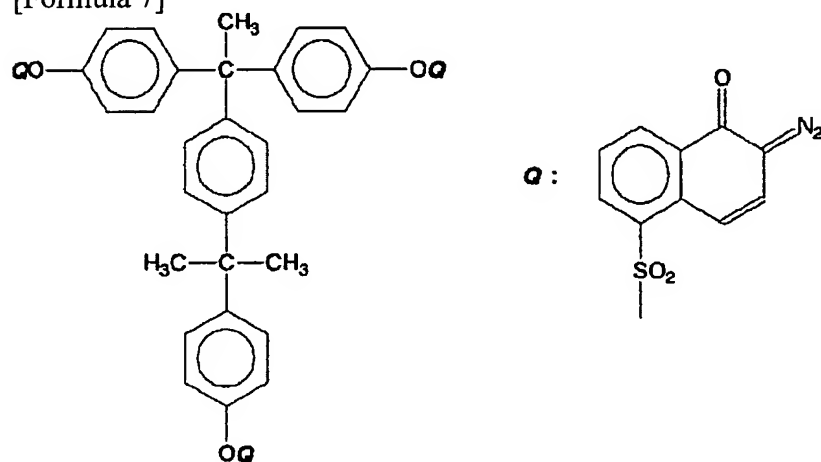
[0036]

[The example 3 of a comparison] 5-norbornene -2 and 26.26g (0.16 mols) of 3-dicarboxylic acid anhydrides were used instead of JI (tert-butyl) dicarbonate, except having made closure reaction time

into 17 hours, the same actuation as an example 1 was performed, and 96.7% of rates of end closure and the aromatic series polyhydroxy amide of weight-average-molecular-weight Mw:10,300 were obtained. [0037] Using the polymer obtained in each above-mentioned example, the positive type photopolymer constituent was prepared, respectively and conservation stability, a patterning property, the machine physical properties of a film, etc. were evaluated. First, after dissolving each polymer 100 weight section and the sensitization agent (** 7 reference) 20 weight section in the gamma butyrolactone 160 weight section, it filtered with the 0.2-micrometer filter and the photopolymer constituent was prepared.

[0038]

[Formula 7]



[0039] Assessment 1: The constituent of conservation ***** was isolated preparatively in part 24 hours after filter filtration, and protection-from-light storage was carried out for seven days at 23 degrees C. The solution viscosity before and behind this protection-from-light storage was measured with the Tokyo Keiki E mold viscometer, viscosity rate of change was computed, and it considered as the index of conservation stability. A result is shown in a table 1.

[0040]

[A table 1]

	初期粘度 (poise)	23℃*7 日後 (poise)	粘度変化率 (%)
実施例 1	24.6	24.7	+0.4
実施例 2	25.1	25.3	+0.8
実施例 3	24.0	24.5	+2.1
比較例 1	25.0	29.2	+16.8
比較例 2	25.5	27.9	+9.4
比較例 3	25.3	25.7	+1.6

[0041] Moreover, homogeneity spreading was carried out on the silicon wafer using the spin coater, this constituent was prebaked for 200 seconds on 120-degree-C hot plate, and need number-of-sheets creation of about 12 micrometers (for patterning assessment) of initial thickness and the 15 micrometers (for machine physical-properties measurement) wafer spreading film was carried out. The spreading rotational frequency of a spin coater was suitably set up for every sample that this initial thickness should be attained.

[0042] Assessment 2: It lets reticle with a test pattern pass to the wafer spreading **** sheet for the patterning assessment above-mentioned patterning assessment, and they are 500 mJ/cm2 at i-line stepper (NIKON make). It exposed. this exposure film -- Tokyo -- adaptation -- time amount was suitably changed for every prepared wafer using make NMD-3 developer (tetramethylammonium hydroxide 2.38% aqueous solution), paddle development was given, and dissolution clearance of the exposure

section was carried out. After development, the rinse was succeedingly carried out with purified water for 20 seconds, dissolution was stopped, it was air-dry in the nitrogen air current, and the pattern assessment sample was created.

[0043] Visual observation of the resolution of this sample, the residue, etc. was carried out under the optical microscope, and the resolution in the developing time from which the most detailed and good patterns (the Bahia hall, a line, space, etc.) were obtained was evaluated. Moreover, while measuring the spreading thickness in the development order of the unexposed section and computing and evaluating an unexposed section remaining rate of membrane (with [if it is unit % and 100%] no thickness change before and after exposure), from this value and the value of the developing time (Dosetoclear) of the exposure section, the dissolution rate ratio of the exposure section and the unexposed section was computed, and it considered as the index of solution image contrast. A result is shown in a table 2.

[0044]

[A table 2]

	初期膜厚 (μm)	最適 現像時間 (sec)	解像度 (μm)	未露光部残 膜率 (%)	露光部/未露光部溶解 速度比
実施例 1	12.01	120	5	98	14.3
実施例 2	11.94	95	5	91	11.1
実施例 3	12.05	135	5	94	16.5
比較例 1	12.03	220	15	80	5.0
比較例 2	11.98	175	10	86	7.1
比較例 3	12.00	105	6	83	5.9

[0045] Assessment 3: The wafer spreading film for film machine physical-properties assessment machine physical-properties assessment was set to the vertical mold cure furnace (made in Mitsuaki Lindbergh), among nitrogen-gas-atmosphere mind, it performed at 350 degrees C for 2 hours for 2 hours, curing (heating cyclization processing) was performed [320 degrees C] with the three levels of 1 hour by 400 degrees C, and it considered as the poly benzoxazole (PBO) film.

[0046] It exfoliated from the silicon wafer and machine physical-properties assessment was presented with this cure film. The assessment method is ASTM. It was based on D-882-88. A result is shown in a table 3.

[0047]

[A table 3]

試験条件	320°C×2hrs		350°C×2hrs		400°C×1hr	
	応力 (MPa)	伸度 (%)	応力 (MPa)	伸度 (%)	応力 (MPa)	伸度 (%)
実施例 1	118.1	72.3	121.1	72.4	123.6	71.9
実施例 2	116.9	69.5	118.2	71.3	120.5	70.7
実施例 3	115.9	70.4	118.9	70.4	119.2	69.9
比較例 1	130.3	76.9	137.3	79.5	140.5	78.2
比較例 2	125.4	73.5	127.6	76.1	132.3	76.5
比較例 3	122.5	74.0	126.5	53.2	129.0	41.3

[0048] Conservation stability is very high, and the constituent using the polymer of the example of this invention shows the outstanding solution image contrast (the exposure section / unexposed section dissolution rate ratio) and the outstanding patterning property, and becomes what has very high flexibility, without being dependent on heat hardening temperature also in machine physical properties, and is practical enough as the surface-protection film of a semiconductor device, and an interlayer

insulation film use. On the other hand, since a chain end continues being amino base nature, the constituent using the polymer of the example 1 of a comparison has the unusually large viscosity rate of change by the denaturation of a sensitization agent, and deterioration, and cannot be used.

[0049] Although the polymer of the example 2 of a comparison is the case that the rate of end closure is lower than the requirements for this invention, developing time insufficient [dissolution ability] and long is required, for this reason, a remaining rate of membrane and resolution are also low, and generating of remnants of the constituent using this is also intense, and it is clearly more nearly deficient in it than this invention to practicability. Although the polymer of the example 3 of a comparison imitates the well-known end closing method The machine physical properties of the heat-curing film of the constituent using this Although it is the value which is not different from the example of this invention at the time of an about 320-degree C low-temperature cure In order to have caused the sharp ductility lowering considered to be based on **** of the crosslinking bond of the aliphatic series nature and for high temperature processing to use the surface-protection film of a semiconductor device, an interlayer insulation film, etc. for an indispensable use as curing temperature becomes high, it is not desirable in respect of reliability.

[0050]

[Effect of the Invention] As stated above, the aromatic series polyhydroxy amide of this invention and the positive type photopolymer constituent using this have the outstanding conservation stability and the outstanding alkali dissolution property, and a patterning property, can be made satisfied [without depending on a heat hardening process] with high level of a property also about the thermal resistance and the dynamics engine performance which be simultaneously demanded as the surface protection film of a semiconductor device, and an interlayer insulation film use, and be fully industrially available as promising alternate material of an organic solvent development mold polyimide precursor.

[Translation done.]